

(iii) A hot running transient cycle where you start to measure emissions after an engine is started, warmed up, and running.

(2) *Cruise cycles.* Cruise test cycles are typically specified in the standard-setting part as a discrete operating point that has a single speed command.

(i) Start a cruise cycle as a hot running test, where you start to measure emissions after the engine is started and warmed up and the vehicle is running at the target test speed.

(ii) Sample emissions and other parameters for the cruise cycle in the same manner as a transient cycle, with the exception that the reference speed value is constant. Record instantaneous and mean speed values over the cycle.

§ 1066.407 Vehicle preparation and preconditioning.

This section describes steps to take before measuring exhaust emissions for those vehicles that are subject to evaporative or refueling emission tests as specified in the standard setting part. Other preliminary procedures may apply as specified in the standard-setting part.

(a) Prepare the vehicle for testing as described in 40 CFR 86.131.

(b) If testing will include measurement of refueling emissions, perform the vehicle preconditioning steps as described in 40 CFR 86.153. Otherwise, perform the vehicle preconditioning steps as described in 40 CFR 86.132.

§ 1066.410 Dynamometer test procedure.

(a) Dynamometer testing may consist of multiple drive cycles with both cold-start and hot-start portions, including prescribed soak times before each test phase. See the standard-setting part for test cycles and soak times for the appropriate vehicle category. A test phase consists of engine startup (with accessories operated according to the standard-setting part), operation over the drive cycle, and engine shutdown.

(b) During dynamometer operation, position a cooling fan that appropriately directs cooling air to the vehicle. This generally requires squarely positioning the fan within 30 centi-

meters of the front of the vehicle and directing the airflow to the vehicle's radiator.

(1) For vehicles with GVWR at or below 14,000 lbs, you may use either of the following cooling fan configurations:

(i) Use a fixed-speed fan to appropriately direct cooling air to the vehicle with the engine compartment cover open. The fan capacity may not exceed 2.50 m³/s. If you determine that additional cooling is needed to properly represent in-use operation, use good engineering judgment to increase the fan's capacity or use additional fans, subject to our approval.

(ii) Use a road-speed modulated fan system that achieves a linear speed of cooling air at the blower outlet that is within ± 3.0 mph (± 1.3 m/s) of the corresponding roll speed when vehicle speeds are between 5 and 30 mph (2.2 to 13.4 m/s), and within ± 6.5 mph (± 2.9 m/s) of the corresponding roll speed at higher vehicle speeds. The fan must provide no cooling air for vehicle speeds below 5 mph, unless we approve your request to provide cooling during low-speed operation based on a demonstration that this is appropriate to simulate cooling for in-use vehicles. We recommend that the cooling fan have a minimum opening of 0.2 m² and a minimum width of 0.8 m.

(2) For vehicles with GVWR above 14,000 lbs, use a road-speed modulated fan system that achieves a linear speed of cooling air at the blower outlet that is within ± 3.0 mph (± 1.3 m/s) of the corresponding roll speed when vehicle speeds are between 5 and 30 mph (2.2 to 13.4 m/s), and within ± 10 mph (± 4.5 m/s) of the corresponding roll speed at higher vehicle speeds. The fan must provide no cooling air for vehicle speeds below 5 mph, unless we approve your request to provide cooling during low-speed operation based on a demonstration that this is appropriate to simulate the cooling experienced by in-use vehicles. We recommend that the cooling fan have a minimum opening of 2.75 m², a minimum flow rate of 3,600 m³/min at 50 mph, and that it maintain a minimum speed profile across the duct, in the free stream flow, of $\pm 15\%$ of the target flow rate.

(3) If the cooling specifications in this paragraph (b) are impractical for special vehicle designs, such as vehicles with rear-mounted engines, you may arrange for an alternative fan configuration that allows for proper simulation of vehicle cooling during in-use operation, subject to our approval.

(c) Record the vehicle's speed trace based on the time and speed data from the dynamometer. Record speed to at least the nearest 0.01 m/s or 0.1 mph and time to at least the nearest 0.1 s.

(d) You may perform practice runs for operating the vehicle and the dynamometer controls to meet the driving tolerances specified in §1066.430 or adjust the emission sampling equipment. Verify that the accelerator pedal allows for enough control to closely follow the prescribed driving schedule. You may not measure emissions during a practice run.

(e) Inflate the drive wheel tires according to the vehicle manufacturer's specifications. The drive wheels' tire pressure must be the same for dynamometer operation and for coastdown procedures for determining road-load coefficients. Report these tire pressure values with the test results.

(f) For vehicles with GVWR above 14,000 lbs, you must use a vehicle pull down mechanism that allows simulation of the actual normal forces that the tire and dynamometer roll interface would see if a loaded vehicle were actually being tested. Use of this mechanism will ensure that wheel slip does not occur when trying to accelerate the loaded vehicle.

(g) Use good engineering judgment when testing vehicles in four-wheel drive or all-wheel drive mode. This may involve testing on a dynamometer with a separate dynamometer roll for each drive axle. This may also involve operation on a single roll, which may require disengaging the second set of drive wheels, either with a switch available to the driver or by some other means; however, operating such a vehicle on a single roll may occur only if this does not decrease emissions or energy consumption relative to normal in-use operation. Alternatively, for heavy-duty motor vehicles, up to two drive axles may use a single drive roll, as described in §1066.210(d)(2).

(h) Warm up the dynamometer as recommended by the dynamometer manufacturer.

(i) Following the test, determine the actual driving distance by counting the number of dynamometer roll or shaft revolutions, or by integrating speed over the course of testing from a high-resolution encoder system.

§ 1066.420 Pre-test verification procedures and pre-test data collection.

(a) Follow the procedures for PM sample preconditioning and tare weighing as described in 40 CFR 1065.590 if your engine must comply with a PM standard.

(b) Unless the standard-setting part specifies different tolerances, verify at some point before the test that ambient conditions are within the tolerances specified in this paragraph (b). For purposes of this paragraph (b), "before the test" means any time from a point just prior to engine starting (excluding engine restarts) to the point at which emission sampling begins.

(1) Ambient temperature must be (20 to 30) °C. See §1066.430(m) for circumstances under which ambient temperatures must remain within this range during the test.

(2) Atmospheric pressure must be (80.000 to 103.325) kPa. You are not required to verify atmospheric pressure prior to a hot-start test interval for testing that also includes a cold start.

(3) Dilution air conditions must meet the specifications in 40 CFR 1065.140, except in cases where you preheat your CVS before a cold-start test. We recommend verifying dilution air conditions just before starting each test phase.

(c) You may test vehicles at any intake-air humidity.

(d) You may perform a final calibration of proportional-flow control systems, which may include performing practice runs.

(e) You may perform the following procedure to precondition sampling systems:

(1) Operate the vehicle over the test cycle.

(2) Operate any dilution systems at their expected flow rates. Prevent aqueous condensation in the dilution systems.